

tached, one on each side, to lateral processes of the stem, by a joint which allows the slightest motion of the water to communicate free vibratory oscillations to the nematophore. The inferior nematophore is free, tubular, much shorter than the lateral, and arising from a tumescent prominence on the stem, slightly below the base of the calycle, is directed upwards towards its anterior aspect. The superior nematophore is somewhat smaller, but in form and direction corresponds precisely with the inferior, it arises on a level with the upper margin of the calycle from the stem, which is here quite even and presents no enlargement similar to that which marks the origin of the lower nematophore.

Gonosome.—Unknown.

Habitat.—Off Cape Comorin in 50 fathoms, and off the coast of Cheduba Island in 8 to 10 fathoms.

ENDENDRIUM RAMOSUM (nov. spec.)

(Plate XII.)

Trophosome.—Tree-like, stem much and irregularly branched, attaining a height of $3\frac{1}{2}$ or 4 inches, fascicular and rooted by an entangled mass of short fibrous filaments, the branchlets are more or less dichotomously arranged and are all annulated at their origins.

Gonosome.—Gonophores consisting of clusters of spherical bodies, filled with a granular substance. They appear not to be borne on true blastostyles, but on the bodies of atrophied hydranths from which the tentacles have disappeared.

Habitat.—In 40 fathoms off Cape Comorin, and very sparingly, in from 10 to 70 fathoms, along the coast of Arrakan.



XI.—*Notes on the Formation of the Country passed through by the 2nd Column Tal Chotali Field Force during its march from Kāla Abdul-lah Khān in the Khōjak Pass to Lūgārī Bārkhān. Spring of 1879.*—
By LIEUT. R. C. TEMPLE, 1st Ghoorkas.

(With Map—Plate XIII.)

General Features—There are one or two features general to the country passed through upon which it would be as well to remark before proceeding to note in detail the formations met with during the various marches.

The Glacis.—The most remarkable feature to be observed all over Southern Afghanistan is the peculiar gradual slope, or *glacis*, leading up

to the foot of the hills which encompass the numerous valleys into which the country is split up. The hills, which are usually bare of trees, of course vary greatly in height and form, but uniformly at foot is this glacis or slope between them and the valley level. It varies, of course, under various circumstances as to length and height, but its presence is invariable. To the west of the Khójak Pass, where the so-called Khója Amrán Range rises some 3000 feet above the valley—the Kadanei—it is about 15 miles long and 1000 feet in height, *i. e.*, the apparent foot of the Range is about 1000 feet higher than the real level of the valley. In the narrower valleys, such as the Gwál near Quetta, which is only 3 to 4 miles broad, the glacis on either side reaches nearly to the middle of the valley. It is generally very stony and covered with detritus from the hills. The streams over it, which are very numerous as a rule, have wide stony beds over which the water rushes with ever so much force, but to no great depth, after every heavy fall of rain. The torrents very quickly dry up, and very few of the streams have even a little water trickling in places from springs in the bed. The larger streams rush down several channels, the higher spots between which seem also to be liable to sudden and violent floods whenever a more than usually heavy fall of rain occurs in the hills above. These facts seem to lead to the hypothesis that the slopes have been formed by excessive denudation going on in the hills in consequence of their bare and treeless condition. But there seems to be another cause. Many of the hills, especially about the Pishin valley, appear to be formed of a slaty shale which is much disintegrated and split up at the surface towards the hill tops. It can be broken, or rather chipped, off easily by the hand, or even by the mere weight of the foot passing over it. The cold at the summits of these bare and exposed hills is intense; the heights being, say 7500 to 8000 feet, and it is possible that denudation is helped by the action of frost which separates the shale chips to be washed down by the next shower; and from the appearance of the hill sides it is probable that large quantities of these chips are in places brought down by every shower.

Metals.—Many parts of the country appeared to me to contain copper and iron in large quantities in the soil, but the specimens sent herewith will probably do something towards proving their presence and in what quantities they occur. There is a small isolated hill in the Dof valley, at the entrance of the Surai Pass, which appeared to me to affect the action of my prismatic compass. I have heard it asserted that gold is to be found in the quartz about the Pishin valley and the Khója Amrán Range, but I cannot say I saw any myself or any quartz likely to be auriferous.

Salts.—The soil in many places is white with nitre or salts of sorts: and this occurs in all parts of the country traversed. The water in many



SKETCH MAP

TO ACCOMPANY

THE GEOLOGICAL SPECIMENS COLLECTED DURING THE MARCH OF THE 2nd COLUMN, TAL GHOTIALI FIELD FORCE,

FROM

KALA ABDULLAH KHAN IN THE KHOJAK PASS

TO

LUGHARI BARKHAN

Spring of 1879.

COMPILED BY LIEUT. R. C. TEMPLE, 1st. GHOORKHAS.

Scale 16 Miles = 1 Inch.



REFERENCE.

- Line taken by the compiler during the march.
- Routes taken by the Quetta Column, Frontier Expeditionary Force
- Lines taken by 1st and 3rd Columns, Tal Ghotiali Field Force
- Lines of Roads known to exist, but not traversed
- Line of Railway.

I(t(tl vr be ei w 3: fe h G r(ei o s(t(w d b o s: t s(v s c i i i d t s d a l t c) R 3 a

7
24

places, both well and river, evidently holds salts in solution ; in some places, as in Sagar and the Trikh Kuram Pass, it is undrinkable from its saltness.

Overgrowths.—One of the most distinctive features of Southern Afghanistan is the want of trees, but this appears to me to be due more to the inhabitants than to nature. In the higher regions, *i. e.*, above 8000 feet, the hills and uplands are fairly wooded with junipers and conifers of sorts, and wherever from various reasons the country is uninhabited, as in the Surai Pass, the Hanumbár Pass and all the land between the Trikh Kuram Pass and the Han Pass the country is fairly wooded with olives, bér and bábul trees with tamarisks and a dwarf palm in the lower and damper grounds. Indeed about the Hanumbár Pass there is a forest of bér and bábul trees. There is, however, another general feature to be observed everywhere after the Bolán and Han Passes are once crossed, the presence of southernwood and camel-thorn, which is universal. Grasses also of sorts flourish in most places, so that it may be presumed that the soil is the reverse of being unproductive were any efficient system of irrigation to be introduced. And it did not appear that water is really wanting in the country if trouble and skill were used in finding it.

Fossil remains.—After Khwára in the Shór valley testacean fossils abound, and the hills about the Hanokai and Han Passes may be described as being one mass of fossils, some in a wonderfully complete state of preservation, as the accompanying collection will show. They appear to be of the post-tertiary period. The same may be said of the whole country between the Han Pass and the plains *viâ* the Cháchar Pass. I only saw one fossil of an animal which was picked up near Ningánd in the Ghazgai valley. (No. 203.)

Notes en Route.

North Pishin Valley.—Hills apparently of volcanic origin, basalt and shale ; quartz is found in layers between the strata which are irregular, faulted, and much folded with dips at great angles. The hills are bare and greatly scoured by water. The Pishin is an open valley about 25 miles long and 20 miles broad.

Kala Abdullah Khán.—The hills about this point are bare and somewhat bleak.

North Pishin to Badwán.—The country along the road is intersected by a series of water channels and torrent-beds carrying down enormous quantities of detritus from the hills to the north of the valley, the land between them being much water-worn, apparently scoured after every shower and liable to sudden and violent floods.

To A'izai.—Country torrent-scoured and covered with detritus and in places much broken by the wash of the water : soil, light and sandy.

To Khúshdil Khán.—Country near the hills stony, water-washed and covered with detritus : it is intersected by several torrent beds : soil, light and sandy. About the low lands the country much broken and intersected by deep nullahs : soil, clay. The country is everywhere bare of trees.

To Sharan Káréz, N. E. Pishin.—On the glacis country stony and covered with detritus, intersected by torrent beds. Hills apparently composed of slaty shale and slate with layers of schist cropping up. Country about Sharan Káréz much broken.

Surai Pass.—The country is wild and broken, consisting of a series of conical hills of slaty shale and slate, much disintegrated at the surface, probably from the action of ice and frost.

Dof Valley.—This valley is about 15 miles long by 8 broad. The glacis and water-scoured appearance of the country is similar to that observed in the Pishin valley. Soil, light and friable and not so good as in the Pishin valley.

Gwál Valley.—Valley about 20 miles long by about 3 to 4 broad. Country much the same as before : soil, not deep, say 2 to 2½ feet deep over conglomerate, it is very light and friable.

Pinikai Hills.—The hills are apparently of conglomerate and much water-worn. They have the appearance of being formed of the detritus of a lofty range of mountains like the lower hills in the Himalayan Ranges. The soil seems to be strongly impregnated with lime.

Gurkhai Defile.—The defile is of variable width, having high precipitous rocks of sandstone and grey limestone in the narrower places. It is broken up by low conical hills of soft red and grey clay in the wider portions.

Sagar.—The country is excessively wild and broken. Sagar is a kind of valley between high hills, but it is full of small conical hills of clay and in places of soft disintegrated shaly slate. The soil varies greatly in colour ; white, grey, yellow and a bright red in the clay and bluish in the slate hills, trees are scarce.

Mosái Pass, gorge of the R. Zadún.—Hills at first of soft shaly clay and ironstone, but in the gorge of the river Zadún they are very similar to those in Sagar, and of red, yellow and grey clays. Afterwards the hills become undulating and apparently are of sandstone.

Gorge of the R. Rod.—High mountainous limestone hills with fairly horizontal strata. The soil about Isaf Kach is sandy.

Ush Pass ; Ispira Rágha.—The hills as far as Ispira Rágha seem to be composed of sandstones, clays of various colours, slate and shale,

and lime crystals of sorts abound. The country is fairly wooded with junipers, conifers and bér trees: about the Ush pass it is fairly open; about Ispira Rágha wild and hilly.

Topobargh Pass; Momand.—Country same as about Ispira Rágha. Mómand is an open upland hilly plateau.

Nangalúna Pass and Plateau.—Country about the Pass is hilly, broken and rocky (gneiss). After the Pass the plateau is reached. It is of considerable width, but it is intersected by curious low flat-topped hills running north to south. It is wooded, as before, in the upper heights, but is bare of trees below 8000 feet. The hills appear to be composed of clays and sandstones of sorts with schist and gneiss cropping up in places.

Khwára.—After Khwára limestones begin to predominate and fossils, especially testacean, to abound.

Chimján.—The country is waterscoured, stony and treeless.

Mt. Syájgai.—Mt. Syájgai is a curious isolated mountain in the middle of the Shór valley. It rises about 1000 feet above the valley and almost perpendicularly for the last 300 feet. It is flat-topped, measuring at top about $2\frac{1}{2}$ miles in length by about $\frac{1}{2}$ mile in breadth. It is of limestone and full of fossils even at the summit. Fossils abound also about Chimján.

R. Zaghlum to Pálkai Pass.—The country is here remarkable for five almost parallel lines of hills about one mile to $1\frac{1}{2}$ miles apart enclosing hilly valleys. After these the country to the north is mountainous as far as the Zhób valley, 12 miles. The hills appear to be of limestone with trap in the gorges. The strata are very much broken and faulty.

Shór Valley.—Country much water-worn and very stony. The valley is about 20 miles long and about 5 to 15 miles broad.

Mzarai Valley.—The country much as before, but cut into by deep nullah beds.

Baiánai Pass.—Hills of soft white limestone. Country wild and rugged, much cut into by nullahs which are full of limestone chips from the hills, white, greenish and reddish.

Ghazgai Valley.—Valley 15 miles long by about 5 broad. Country as before, but more grass and overgrowths. Soil, richer than heretofore. Hills of limestone with very folded strata.

Borai Valley.—This valley is, say, 40 miles long and from 8 to 15 miles broad. The soil is good and fertile; there is no water-scour except about the streams; putt and kunker are found in the lower lands. Hills of limestone with very broken strata.

Hanumbár Pass.—Country *en route* various; putt and rough stony water-worn places, especially about the rivers, of which 4 or 5 meet in the Pass, which appears to be the only outlet southwards for some distance